3SR8

3 Phase Step Motor Drive

User Manual

Rev. 1.0

AMP & MOONS' AUTOMATION

Contents

1 Introduction 3
1.1 Overview 3
1.2 Features 3
1.3 Block diagram 4
2 Mounting the Drive 4
3 Connections 5
3.1 Connecting to the Power Supply 5
3.2 Connecting to a Motor 5
3.3 Connecting to the Inputs and Output 6
3.3.1 Step & Direction Inputs 6
3.3.3 Fault Output 8
4 Switch Selection 9
4.1 Running Current 9
4.2 Idle Current 9
4.3 Microstepping 9
4.4 Self test 10
6 Error Codes 12
7 Reference Materials 13
7.1 Mechanical Outline 13
7.2 Specifications 13
7.2.1 Electrical Specifications 13
7.2.2 Environmental Specifications 14
7.3 Torque Curves 14
8 Contacting MOONS' 15

1 Introduction

Thank you for selecting the MOONS' 3SR8 Motor Drive. We hope our commitment to performance, quality and economy will make a successful motion control project.

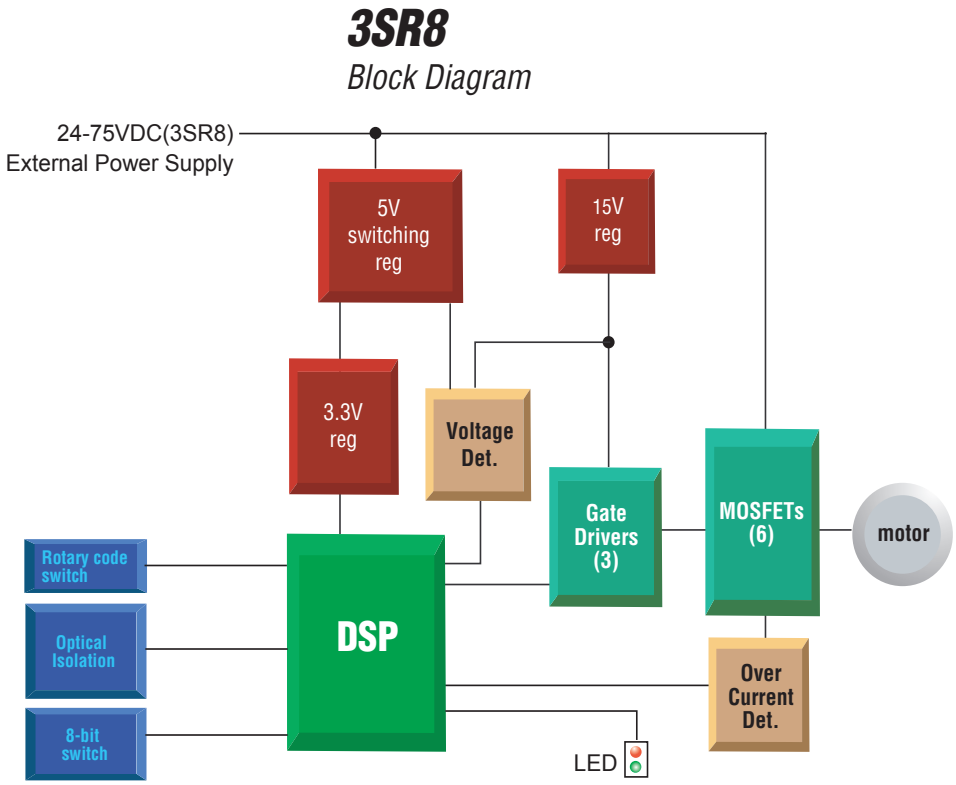
1.1 Overview

The 3SR8 series drives are cost-effective, high performance 3 phase step drives. The design is based on PID current control technology, and features high torque, low noise, and low vibration. The running current and microstep resolution are switch selectable.

1.2 Features

- Power Supply - operates from a 24 to 75 volt DC power supply
- Output Power - 3 position switch selectable, 8 settings, maximum 7.8 amps peak
- Current Control - advanced digital current control provides excellent high speed torque
- Microstep Resolution - 3 position switch selectable, 8 settings: 1000, 1600, 2000, 3200, 4000, 5000, 6400, 51200 step/rev
- Speed Range - speeds up to 1800 rpm
- Anti Resonance - raises the system-damping ratio to eliminate midrange instability and allow stable operation throughout the speed range of the motor.
- Auto Setup - measures motor parameters and configures motor current control and anti-resonance gain settings
- Microstep Emulation - performs high resolution stepping by synthesizing coarse steps into fine micro-steps
- Control Modes - Step & Direction (contact factory for CW/CCW pulse option)
- Input Digital Filters - 150K Hz or 2M Hz digital filter for high speed inputs
- Motor Type Select - a 16 bit rotary switch is used to select the desired motor database which is pre-loaded at the Factory
- Load Inertia Select - as part of the motor database each motor can be selected for use with low or high load inertia.
- Idle Current - switch selectable for 50% or 90% idle running current reduction 1 second after the motor stops
- Self Test - switch selectable, the drive will perform a 2 rev, 1 rps, CW/CCW move test

1.3 Block diagram



2 Mounting the Drive

The 3SR8 Step Drive can be mounted on the wide or the narrow side of the chassis. If it is mounted on the wide side, M3 screws should be used through the four corner holes. For narrow side mounting applications, M3 screws can be used in the two side holes.

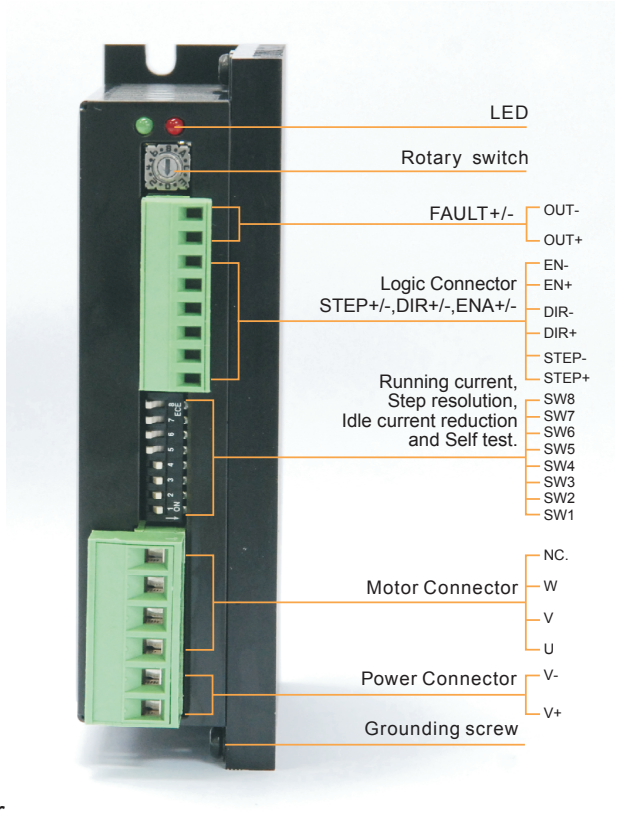
The amplifiers in the drive generate heat. To operate the drive continuously at maximum power forced air cooling, as from a fan, should be provided.

Never use the drive in a space where there is no air flow or where other devices can cause the surrounding air to be more than 40 °C. Never put the drive where it can get wet or where metal particles can fall into it.

3 Connections

To use the 3SR8 Step Drive, the following items are needed:

- A power supply (24 - 75 VDC)
- Pulse & Direction signal
- A compatible step motor



3.1 Connecting to the Power Supply

If the power supply does not have a fuse on the output or some kind of short circuit current limiting device, a fast acting fuse is required. A 7 amp fast acting fuse should be installed in line with the "+" power supply lead.

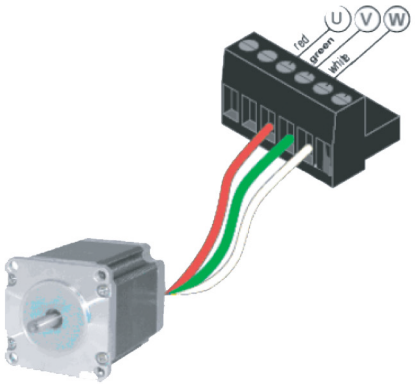
Connect the motor power supply "+" terminal to the drive terminal labeled "V+". Connect the power supply "-" to the drive terminal labeled "V-".

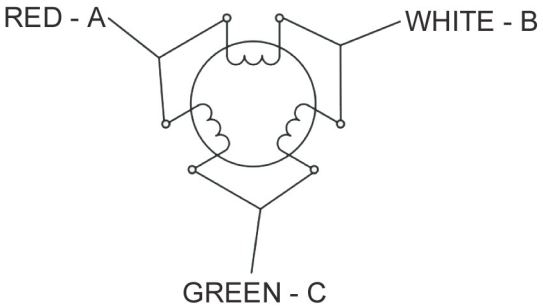
Be careful not to reverse the wires.

3.2 Connecting to a Motor

Never connect the motor to or disconnect it from the drive when the power is on. Never connect the motor leads to ground or to a power supply.

A 3-phase step motor's winding is either a star or delta configuration. A delta connection is best for high speed applications, while a star connection is best for low speed. The 3SR8 drives and MOONS' motors are set up for delta connection. Connect the motor leads to the drive screw terminals U, V, and W. Any two leads may be reversed to change the motor's running direction.





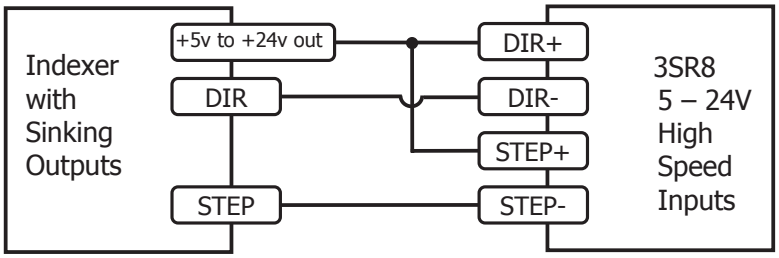
3.3 Connecting to the Inputs and Output

3.3.1 Step & Direction Inputs

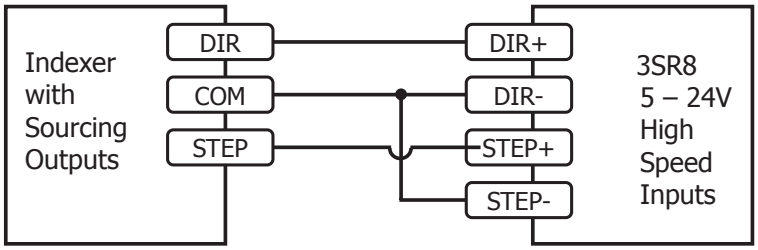
The 3SR8 Step Drive has two high speed optically isolated inputs called STEP and DIR. They accept 5 to 24 volt single-ended or differential signals, up to 2MHz. The maximum voltage that can be applied to the input is 28V.

The motor executes one step with the falling edge of the STEP signal.

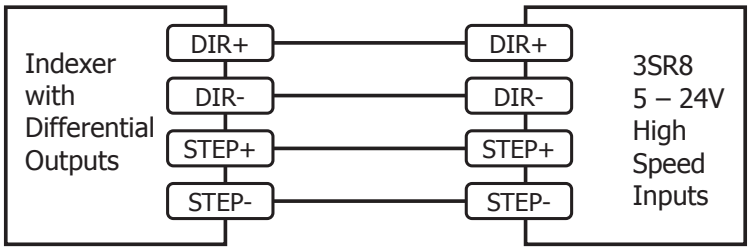
The direction of rotation is controlled by the DIR signal level. A low level signal (0 level) will result in clockwise rotation, and a high level signal (1 level) will result in counterclockwise rotation.



Connecting to Indexer with Sinking Outputs



Connecting to Indexer with Sourcing Outputs



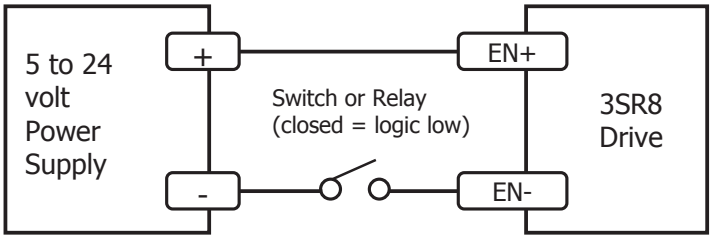
Connecting to Indexer with Differential Outputs
Many high-speed indexers have differential outputs

3.3.2 EN Input

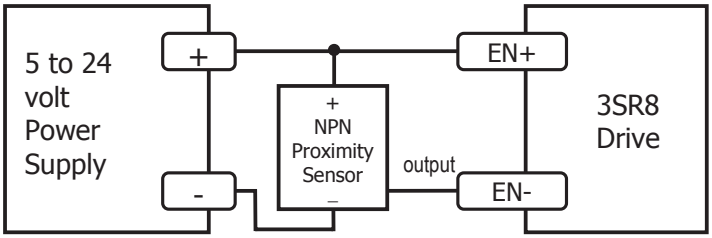
The EN input enables or disables the drive amplifier. It is an optically isolated input that accepts a 5 to 24 volt single-ended or differential signal. The maximum voltage that can be applied to the input is 28V.

When EN input is closed, the driver amplifier is deactivated. All the MOSFETs will shut down, and the motor will be free. When EN input is open, the drive is activated.

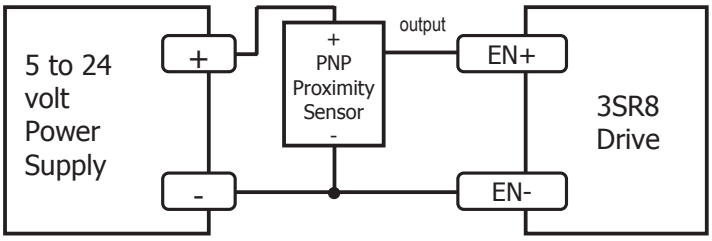
When the drive has encountered an error and the fault is removed from system, a falling signal into the EN input will reset the error status and activate the drive amplifier again.



Connecting the Input to a Switch or Relay



Connecting an NPN type Proximity Sensor to an input
(when prox sensor activates, input goes low)

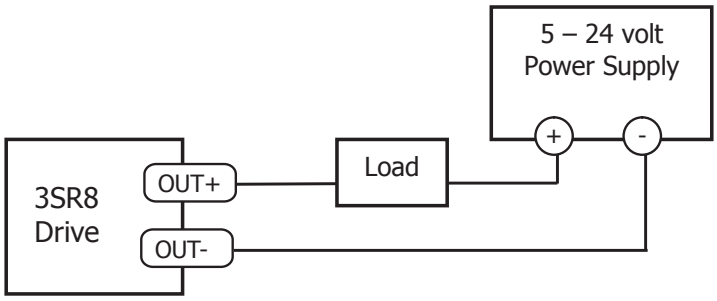


Connecting an PNP type Proximity Sensor to an input
(when prox sensor activates, input goes low)

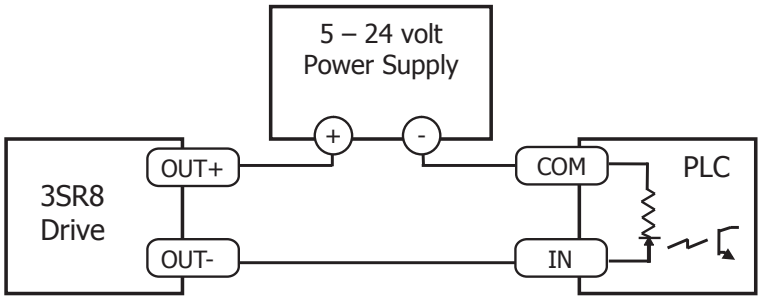
3.3.3 Fault Output

The FAULT Output is optically isolated. The maximum collector current is 100mA, and the maximum collector to emitter voltage is 30 volts. The output can be wired to sink or source current.

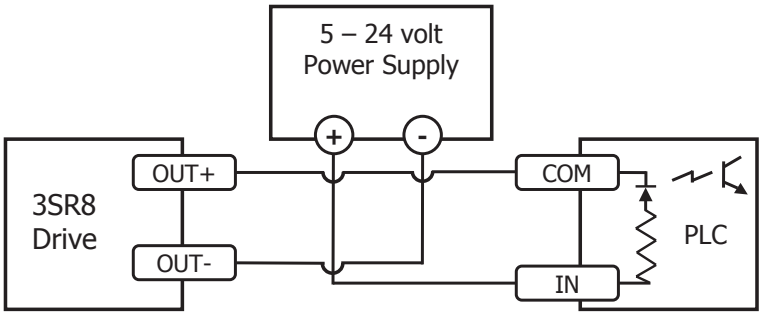
When drive is working normally, the output is open. When the drive encounters an error, the output closes.



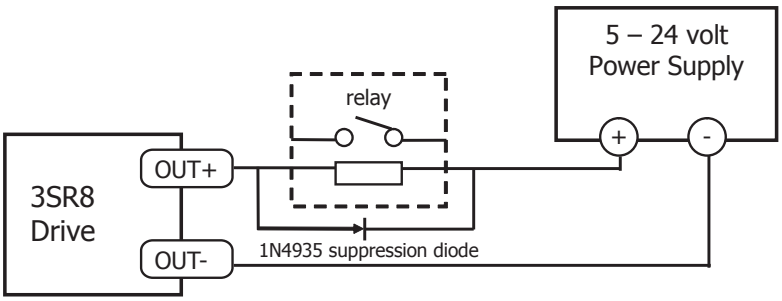
Connecting a Sinking Output



Connecting a Sourcing Output

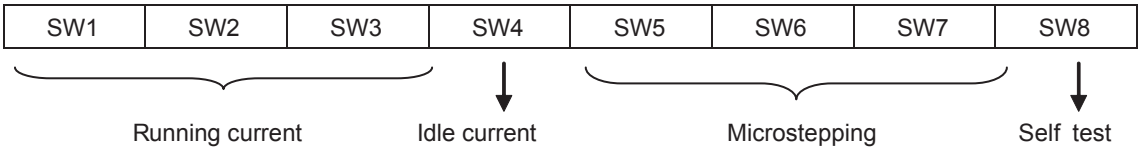


Connecting a Sourcing Output again



Driving a Relay

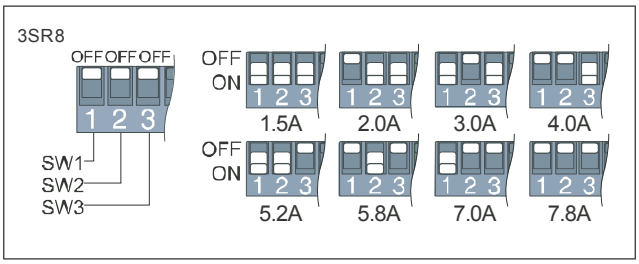
4 Switch Selection



4.1 Running Current

The output current of the 3SR8 Step Drive is set by the SW1, SW2, and SW3 switches and can be changed as necessary. There are 8 settings available according to the ON/OFF combination of the switches.

Peak	SW1	SW2	SW3
1.5A	ON	ON	ON
2.0A	OFF	ON	ON
3.0A	ON	OFF	ON
4.0A	OFF	OFF	ON
5.2A	ON	ON	OFF
5.8A	OFF	ON	OFF
7.0A	ON	OFF	OFF
7.8A	OFF	OFF	OFF



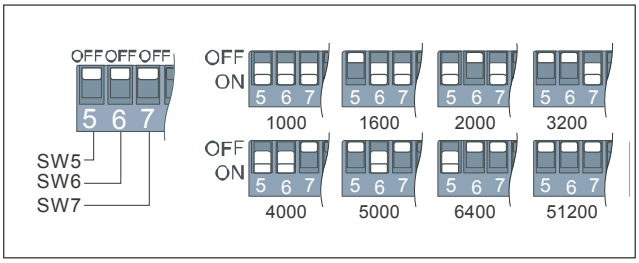
4.2 Idle Current

The running current of the 3SR8 drive is automatically reduced anytime the motor isn't moving for 1S. Setting the SW4 switch to ON reduces the current to 50% of it running value. Setting this switch to OFF maintains 90% of the running current. This 90% setting is useful when a high holding torque is required. To minimize motor and drive heating it is highly recommended that the idle current reduction feature be set to 50% unless the application requires the higher setting.

4.3 Microstepping

The microstep resolution is set by the SW5, SW6 and SW7 switches. There are 8 settings.

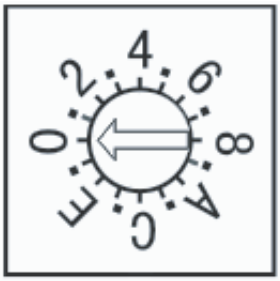
Microstep (step/rev)	SW5	SW6	SW7
1000	ON	ON	ON
1600	OFF	ON	ON
2000	ON	OFF	ON
3200	OFF	OFF	ON
4000	ON	ON	OFF
5000	OFF	ON	OFF
6400	ON	OFF	OFF
51200	OFF	OFF	OFF



4.4 Self test

Setting switch SW8 to ON after the drive is powered up will cause the drive to perform a self test move of 2 revolutions both CW and CCW at 1rps. Setting switch SW8 to OFF will disable this feature.

5 Motor selection



Each position of the 16-bit rotary switch selects a different motor, and automatically sets the configuration parameters in the drive. The 3SR8 drive comes programmed with up to 8 typical motors as factory defaults. Drives can be customized with specially selected motors when required.

The rotary switch also selects a low or high inertia for each motor to allow for various load conditions. The low setting is 1:1, and the high setting is 10:1. Each motor in the loaded database has unique settings to optimize the anti-resonance. See the table below.

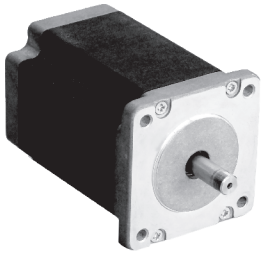
When the motor selection is changed, the drive power supply will need to be cycled.

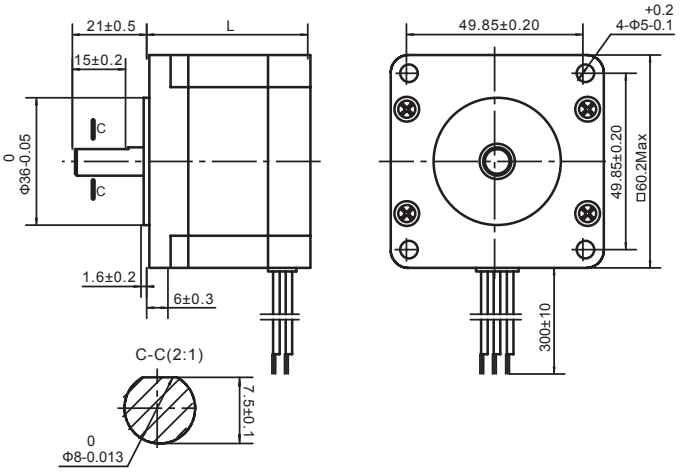
Switch Setting	Motor	Switch Setting	Motor
0	-L	8	H
1	24HC4301-L	9	24HC4301-H
2	24HC4303-L	A	24HC4303-H
3	24HC2301-L	B	24HC2301-H
4	24HC3301-L	C	24HC3301-H
5	34HC0302-L	D	34HC0302-H
6	-L	E	-H
7	-L	F	-H

Motor selections ending in L are for low inertia and those ending in H are for high inertia.

5.1 Recommended motors

24HC Series 1.2°

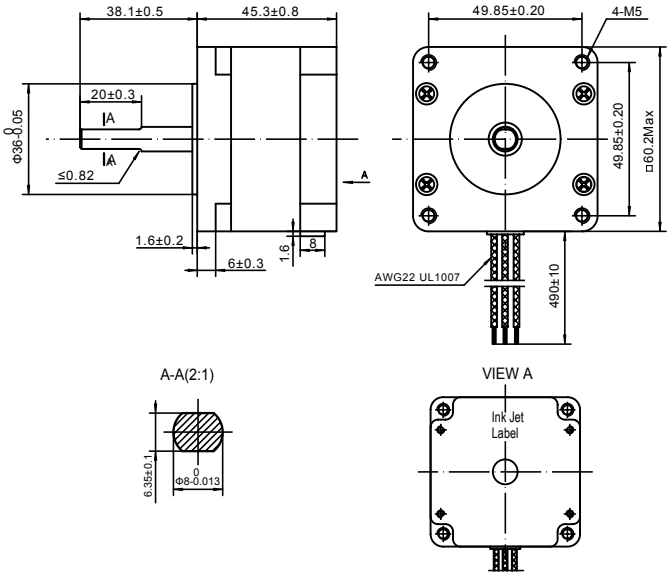




Parameters

PART#	WIRING DIAG	MOTOR LENGTH (mm)	COIL RESISTANCE / PHASE (ohms)	COIL RESISTANCE / PHASE (mH)	CURRENT (A)	MOTOR HOLDING TORQUE (mN·m)	MOTOR DETENT TORQUE (mN·m)	MOTOR INERTIA ($g·cm^2$)	MOTOR WEIGHT (Kg)
24HC2301	E	54.5	0.32	0.76	5.8	900	40	260	0.8
24HC3301	E	76.5	0.45	1.30	5.8	1500	70	460	1.3
24HC4303	E	45.5	0.26	0.45	5.8	540	25	180	0.62

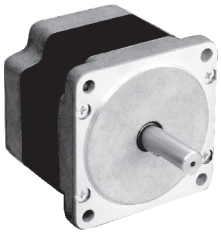
24HC4301-04

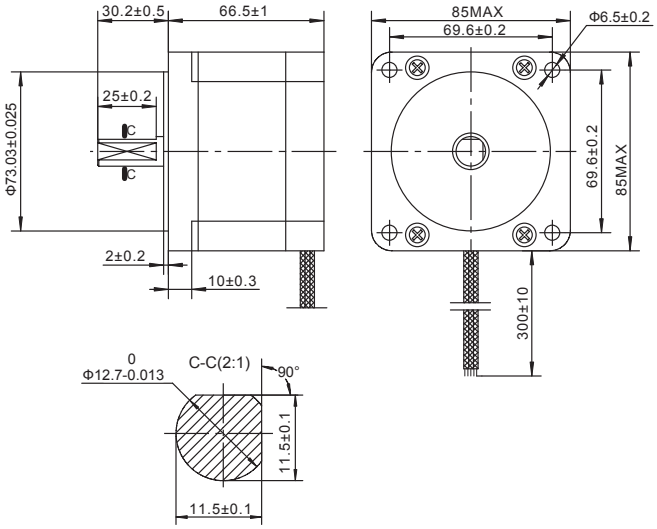


Parameters

PART#	WIRING DIAG	MOTOR LENGTH (mm)	COIL RESISTANCE / PHASE (ohms)	COIL RESISTANCE / PHASE (mH)	CURRENT (A)	MOTOR HOLDING TORQUE (mN·m)	MOTOR DETENT TORQUE (mN·m)	MOTOR INERTIA ($g·cm^2$)	MOTOR WEIGHT (Kg)
24HC4301-04	E	45.3	6	10.2	1.5	540	25	169	0.62

34HC Series1.2°





Parameters

PART#	WIRING DIAG	MOTOR LENGTH (mm)	COIL RESISTANCE / PHASE (ohms)	COIL RESISTANCE / PHASE (mH)	CURRENT (A)	MOTOR HOLDING TORQUE (mN·m)	MOTOR DETENT TORQUE (mN·m)	MOTOR INERTIA ($g \cdot cm^2$)	MOTOR WEIGHT (Kg)
34HC0302-01	E	66.5	0.38	2.4	5.8	2000	100	1100	1.6

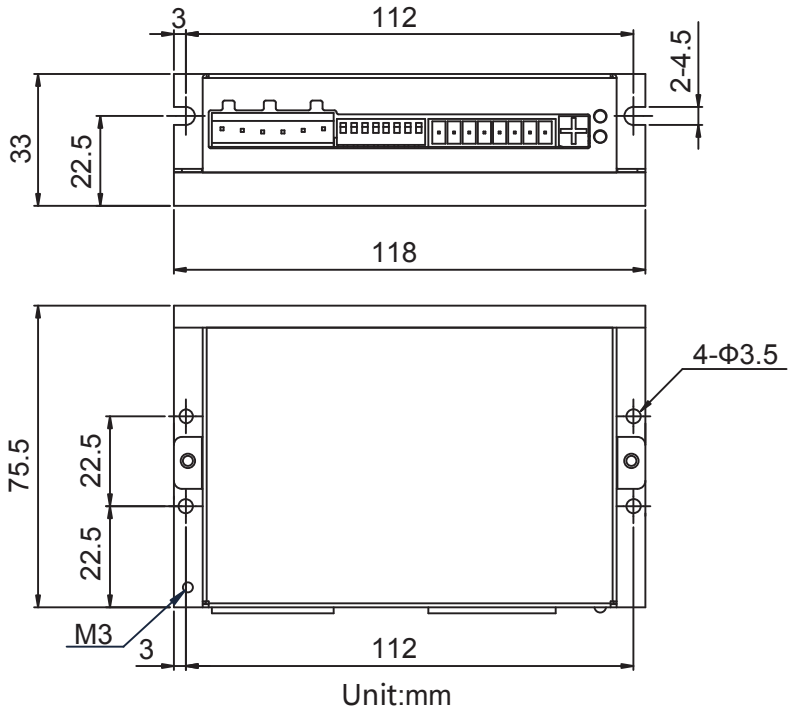
6 Error Codes

The 3SR8 Step Drive has one bicolor (red/green) LED to indicate status. When the motor is enabled, the green LED flashes slowly. When the green LED is solid, the motor is disabled. If the red LED flashes, an error has occurred. Errors are indicated by a combination of red and green flashes as follows:

Code		Error
🟢	Solid green	Motor disabled
🟢🟢	Flashing green	Motor enabled
🔴🔴🔴🟢🟢	3 red，2 green	Bad internal voltage
🔴🔴🔴🔴🟢	4 red，1 green	Over voltage
🔴🔴🔴🔴🟢🟢	4 red，2 green	Under voltage
🔴🔴🔴🔴🔴🟢	5 red，1 green	Over current/short circuit
🔴🔴🔴🔴🔴🔴🟢	6 red，1 green	Open motor winding

7 Reference Materials

7.1 Mechanical Outline



7.2 Specifications

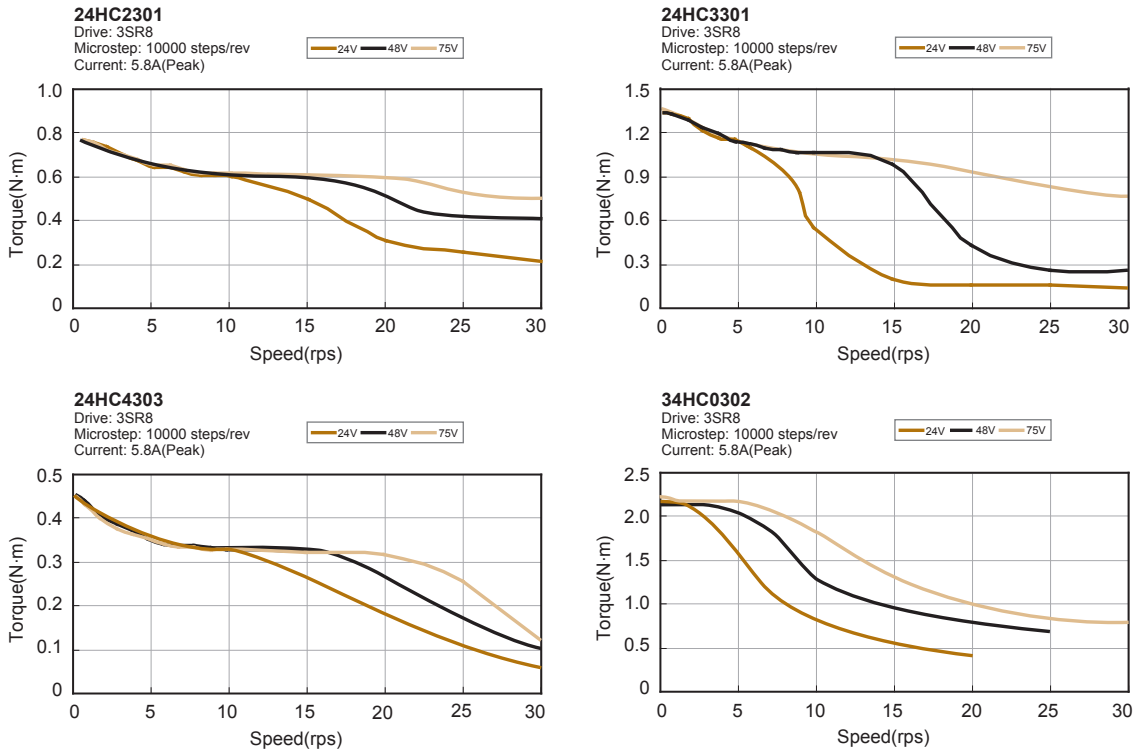
7.2.1 Electrical Specifications

Parameter	Min.	Typ.	Max.	Unit
Power Supply	24	-	75	VDC
Output Current (Peak)	1.5	-	7.8	VDC
STEP/DIR Input Signal Average Forward Current	6	10	15	Amps
Step Frequency	2	-	2M	Hz
STEP Minimum Pulse Width Hi and Low	250	-	-	ns
DIR Minimum Pulse Width	50	-	-	us
Under Voltage Protection	-	20	-	VDC
Over Voltage Protection	-	85	-	VDC
STEP/DIR Input Signal Voltage	4.0	-	28	VDC
OUT Maximum Output Current	-	-	100	mA
OUT Maximum Output Voltage	-	-	30	V
Driver Initialization Time	-	-	2.5	S

7.2.2 Environmental Specifications

Heat Sinking Method	Natural cooling or fan-forced cooling
Surrounding Air Conditions	Avoid dust, oily mist and corrosive air
Operating Temperature	0 - 40°C (32 - 104°F)
Maximum Ambient Humidity	90% non-condensing
Shock	5.9m/s² maximum
Storage Temperature	-10 - 70°C (14 - 158°F)

7.3 Torque Curves



8 Contacting MOONS'

- **Headquarters**
  168 Mingjia Road, Minhang District,
  Shanghai 201107, P.R.China
  Tel: +86 (0)21 52634688
  Fax: +86 (0)21 52634098

- **Shenzhen Branch Office**
  Room 2209, 22/F, Kerry Center, 2008 Renminnan Road, Luohu District,
  Shenzhen 518001, P.R.China
  Tel: +86 (0)755 25472080
  Fax: +86 (0)755 25472081

- **Beijing Branch Office**
  Room 202,Unit 2,7th Building, Huilongsen International Science & Technology
  Industry Park, No.99,kechuang 14th street, Beijing 101111 ,P.R. China
  Tel: +86 (0)10 59755578
  Fax: +86 (0)10 59755579

- **Nanjing Branch Office**
  Room 302, Building A, Tengfei Creation Center, 55 Jiangjun Road, Jiangning District,
  Nanjing 211100, P.R. China
  Tel: +86 (0)25 52785841
  Fax: +86 (0)25 52785485

- **Qingdao Branch Office**
  Room E, 10th Floor, 73 Wangjiao Mansion, Hongkong Middle Road, Shinan District,
  Qingdao 266071, P.R. China
  Tel: +86 (0)532 85879625
  Fax: +86 (0)532 85879512

- **Europe Branch: Moons' Industries (Europe) S.R.L.**
  Via Torri Bianche n.1 20059 Vimercate(MB) Italy
  Tel: +39 039 62 60 521
  Fax: +39 039 96 31 409

Service Center
+86-400-820-9661